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AN APPRAISAL OF THE TAXONOMIC LEVEL OF THE OBJECTIVE TEST ITEMS IN SENIOR SECONDARY CERTIFICATE CHEMISTRY EXAMINATION

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ABSTRACT

A consistently high failure rate reported in Chemistry in recent years call for an indepth and continuous research on the problem of teaching and learning of chemistry in Nigerian Schools. Often the teacher, the curriculum and inadequate facilities are considered the problem, to the complete exclusion of the testing instrument. This study is an attempt to investigate an aspect to the characteristic of the examination questions. The 50 multiple-choice questions of SSCE chemistry Paper 2 were categorized into the different cognitive levels. Findings show that SSCE Chemistry questions are predominately knowledge and comprehension based to the detriment of the assessment of the higher levels of cognitive behaviour. Training for item writer is suggested for an improved assessment instrument.

INTRODUCTION

Evaluating students' progress is a necessity and cannot be underscored. This routine assessment according to Okeke (1981), Ezewu and Okoye (1981) furnishes parents, teachers, school administrators and the students with the information about the students' progress or otherwise in their academic pursuit. When the student becomes aware of his performance, it will motivate him to greater achievement and will also highlight areas of weakness for reinforced performance. According to Ohuche and Akeju (1988), student achievement assessment also enables the teacher to adjudge the adequacy and effectiveness of employed teaching methods. For administrators, students' assessment will aid them to identify and take decisions on the areas of curriculum that need improvement.

Apart from the routine continuous assessment in schools and the end of term examination conducted by teachers, public examinations agency like West African Examination Council (WAEC) also mount examinations for secondary school students all over the country. These sets of examinations make for uniformity of qualification in the larger society. There

examinations also form the basis for recruitment into the public service and admissions for higher education.

The WAEC evaluation scheme for chemistry entails; a practical paper which focuses on student's experimentations, observation, interpretation and understanding of some of the principles involved as well as a theoretical aspect of the examination which comprises an essay part and the multiple choice section.

This paper will be particularly concerned with the assessment of the multiple choice items because of its importance in the students performance.

The Problem

An overview of the WAEC SSCE result over the years show a consistent underachievement in secondary school chemistry (Ajeyalemi and Busari 1986). This has become a serious impediment for the students who would have pursued certain science based courses in institutions of higher learning.

The WAEC SSCE chemistry consists of two papers. Paper 1 examines the practical aspects of the course while paper 2 assesses the theoretical part. The paper 2 consists of two parts. Section A is made up of 50 multiple choice items while Section B is an essay – type test.

The result of the multiple choice test becomes quite important because it is the first set of questions the students tackle in Paper 2. This is assumed bearing in mind the obvious poor results from Paper 1 (practicals) because of poorly equipped laboratories and lack of adequate experience by the students. For a reasonable performance in the whole chemistry examination, the student must do reasonably well in the multiple choice test (Eze, 1986). But this does not seem to be the case

Purpose of Study

This research is aimed at:

1. Identifying and classifying the multiple choice questions of Chemistry paper 2A SSCE examination for 1997, 1998 and 1999 according to the cognitive process involved for each questions
2. Compare the cognitive spread for each set of questions for the 3 years under study

Hypothesis

This research will investigate the hypothesis:

SSCE Chemistry paper 2A questions do not cover all areas of cognitive behaviour of the candidates in the examinations

Methods

Multiple choice questions set by WAEC for SSCE in may/June examinations from 1997 – 1999 were used in this study. Each multiple choice questions as observed by Inyang (1988) and Ansa (1990) is made up of a stem and the options – which include the key (this is the correct option) and the distracters (the incorrect options).

Year/behaviour specification table was drawn to consider how the questions drawn from each year's examination tested certain cognitive behaviours of the candidates according to Bloom's Taxonomy using the criteria as explained by Kissock and Iyortsuun (1982) as follows:

Knowledge: The questions at this level requires a recall from memory previously learned facts, concepts, generalizations and theories.

Comprehension: Here students are expected to express ideas in their own word, demonstrate understanding of a communicated idea or object

Application: Questions at this level require students to demonstrate the use of ideas. They must apply their knowledge in new situations and use it to solve problems.

Analysis: At this level of behaviour, students are to determine the parts of a problem, solution, idea and show how they are related.

Synthesis: This brings about the child's creative ability by putting a number of ideas or objects in a way that is unique and new to them.

Evaluation: Here a student uses a criteria to make a justify judgements about something.

To ascertain the reliability of the researcher's classification of the multiple choice items according to the levels of cognition examined, an independent classification was also conducted by another expert in the field (a lecturer of Test and Measurement with over 10 years experience), and a reliability coefficient of 0.89 was obtained. Where disparity arose, relevant authors like Kissock and Iyortsuun (1982) and Okpala, Onocha and Oyedeji (1993) were referred

Simple percentages was used for data analysis and the result was pictorially represented using the bar chart.

Results

Using the SSCE chemistry paper 2A for each of the years, the researcher carried out a frequency count of the number of items which appeared under the various cognitive levels

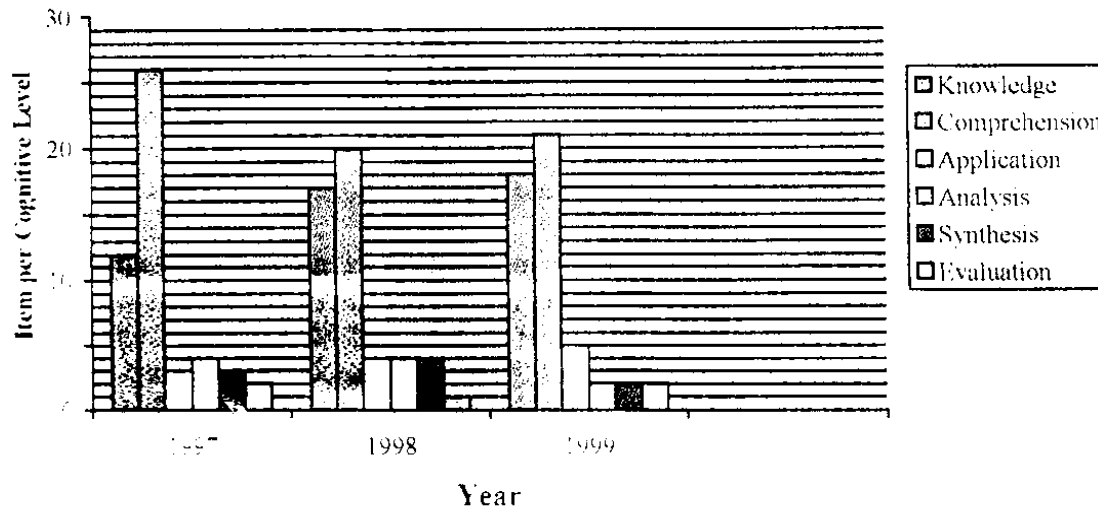
for each year, and these were converted to percentages. The frequencies and percentages of the items for the six cognitive levels are presented on Table I.

Table: Year/Cognitive Level Table for SSCE Chemistry paper 2 Questions

Cognitive levels	1997		1998		1999	
	F	%	F	%	F	%
Knowledge	12	24	17	34	18	36
Comprehension	26	52	20	40	21	42
Application	3	6	4	8	5	10
Analysis	4	8	4	8	2	4
Synthesis	3	6	4	8	2	4
Evaluation	2	4	1	2	2	4

For a better understanding of the data, the frequencies on Table I were plotted on a graph shown as Figure I.

Bar Graph showing the Cognitive Level Spread for Chemistry Paper 2 for 1997 - 1999



An inspection of the graph shows the trend of occurrence of items in the respective levels of cognition. As shown on both Table I and Figure I over 40% of the items for each year concentrated on comprehension questions. This high percentage was keenly followed by the knowledge questions with the result (24% - 1997; 34% - 1998; 36% - 1999) to the detriment of the other levels of the cognitive domain. Interestingly though, the higher levels of the

cognitive domain (analysis, synthesis and evaluation) even though with low percentage representation (less than 10% for each year) were tested unlike the complete neglect as reported by Eze (1986) for physics and Peter *et al* (1986) for biology. Application questions only accounted for (6% - 1997, 8% - 1998 and 10% - 1999) of the questions asked. This could be attributed to the use of application based questions for the practical part (Paper I) of the examination.

Discussion

The findings in this study may be attributed to such factors like the teacher or the testing agency. As reported by Peter *et al* (1986) WAEC employs practising teachers to write their test items, chances are that these teachers in writing the items consider the cognitive emphasis actually used in the day to day teaching of this subject. If this as observed by Black (1980) is the case, then, the teaching – learning interaction is still predominately that of the lower levels of cognition; rote memorization and recall. This does not seem to help the students who are either preparing to get into the tertiary level of education where learning is a lot more abstract, complex and independent. Neither does it help others who cannot further their education and are expected to move into the world of work where responsibility and independence are inevitable.

The restricted use of items from the higher levels of cognition could also be a deliberate attempt by WAEC to keep the examination at the low level. This may arise from an honest intention to ensure that a reasonable percentage of the students pass the examination. This could also lend credence to the observed and consistent lower performance in the university placement examinations conducted by Joint Admissions and Matriculation Board (JAMB). It is often noticed that even students who have credit pass and above in their SSCE chemistry do not perform well in their JAMB chemistry. This observation may necessitate an investigation into the cognitive levels of JAMB questions which on a superficial inspection tends to concentrate more on the higher levels of cognition.

The examination agency (WAEC) could really consider testing the students evenly on all the cognitive levels, but may be frustrated by the inability of item writers who are incapable of testing beyond the levels currently observed. Writing questions on analysis, synthesis and evaluation are considerably more difficult than for the lower levels of behaviour. If that is the case, WAEC needs to work out a viable training programme for their item writers. Multiple choice items writing is a difficult exercise (Eze, 1986) and needs trained hands.

Conclusion

The multiple choice questions of the SSCE chemistry have been found to concentrate on the lower levels of cognition (mainly knowledge and comprehension). This situation could be deliberate by the examination agency with the intention of having more students pass. It could also be attributed to the inability of item writers to set questions of the higher

cognitive behaviour. To improve upon the situation, the examination agency has to mount refresher courses for the item writers if their expertise must improve.

Further studies could examine the cognitive emphasis of the essay and practical aspect of the SSCE chemistry examination which according to Eze (1986) can easily be used to generate question of higher cognitive levels.

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